XML Representations of Music

MusicXML/MEI

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Music 253/CS 275A

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XML history

- eXtensible Markup Language

Version 0 :: 1996
Version 1.0 :: 1998
Version 1.1 :: 2004
Version 1.1.5 :: 2008

http://en.wikipedia.org/wiki/XML

- Predecessor: SGML (Standardized Generalized Markup Language)

1970's – 1980's

http://en.wikipedia.org/wiki/Standard_Generalized_Markup_Language

HTML 1.0 1991
2.0 1995
4.0 1997
5.0 2008

- Predecessor: GML (Generalize Markup Language)

1960's

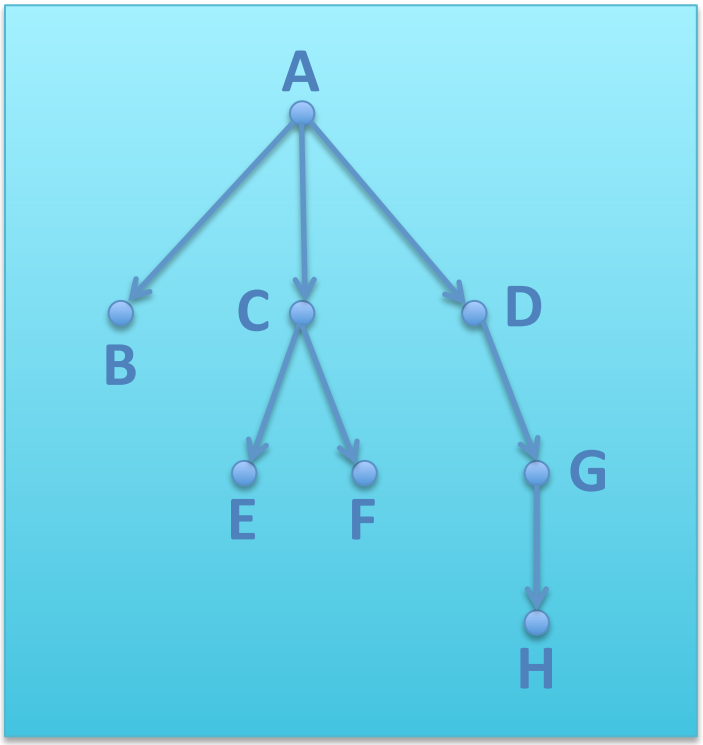
http://en.wikipedia.org/wiki/IBM_Generalized_Markup_Language

XML example

```
<root-node>
    <key>Value</key>
    <key value="2">
    <another-key>
        <subkey/>
    </another-key>
</root-node>
```

XML data structure

- XML describes a tree structure:



- Indented format:

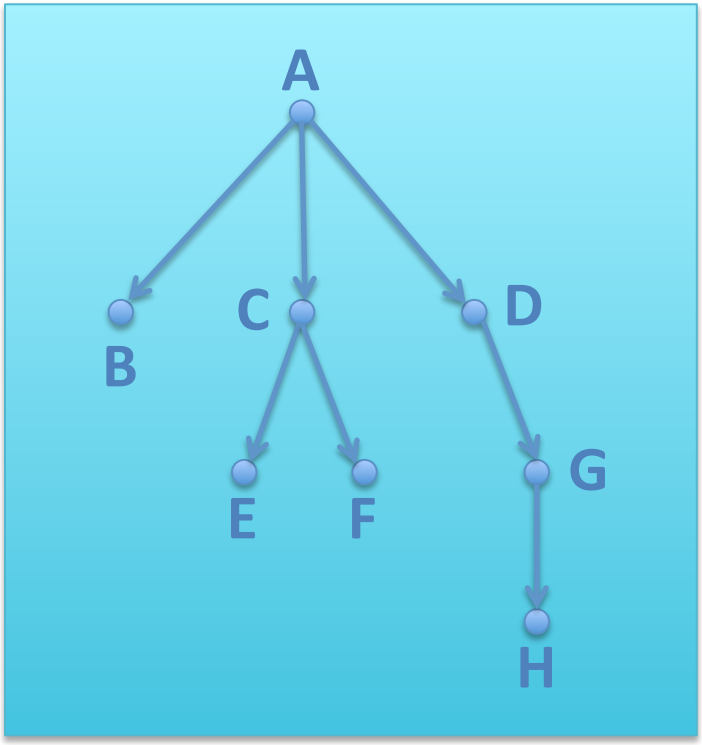
```
<A>
    <B/>
    <C>
        <E/>
        <F/>
    </C>
    <D>
        <G>
            <H/>
        </G>
    </D>
</A>
```

- Equivalent serialization: <A><B/><C><E/><F/></C><D><G><H/></G></D></A>

(whitespace/newlines don't count)

XML data structure

- XML describes a tree structure:



- Same data structure as directories/folders on a hard disk

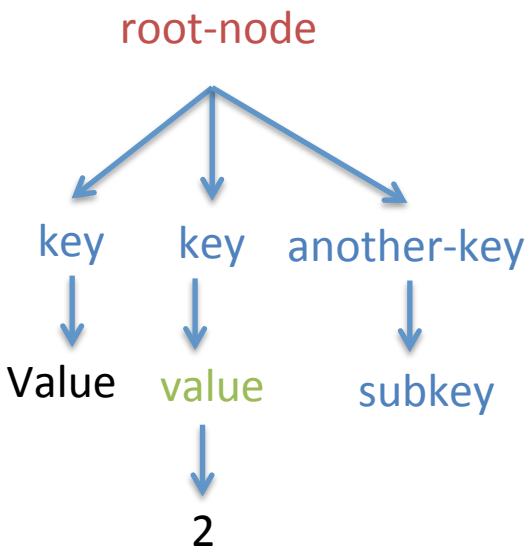
- Same conceptualization as LISP code:

(A B (C E F) (D (G (H))))

Only one “root node” allowed in document

XML example

```
<root-node>
    <key>Value</key>
    <key value="2">
    <another-key>
        <subkey/>
    </another-key>
</root-node>
```



Root element
Element
Attribute
Text

XML Terminology

```
<A>
   <B/>
   <C>
      <E/>
      <F/>
   </C>
   <D>
      <G>
         <H/>
      </G>
   </D>
</A>
```

- <C>…</C> is an ***element*** (tree node)
- C is the element's ***name***
- <C> is a *start* ***tag***
- </C> is an end tag
- <E/> and <F/> are *element* ***content*** of <C> or child nodes of <C>, and <C> is their parent node.
- Plain text inside of an element is *text* ***content***

- <H/> is an element without contents (terminal node)
- <H/> is equivalent to <H></H>
- Start tags *must* be followed by matching end tag, or the shorthand <*xxx*/> must be used.

Element Attributes

- Elements can contain a list of attributes within the start tag
- Like special-purpose child nodes

<A a="1" b="two" c="1 and 2">

- Element **A** has three *attributes*: a, b, and c.
- A is the *name* of the attribute, 1 is its value.
- Attributes must have values. c="" represents an attribute with ana] value.
- Attributes are optional (similar to key values in LISP).
- The value of a is 1, the value of b is two and the value of c is 1 and 2.
- XML Attribute values *must* be enclosed in double or single quotes.
- Only one attribute of a given name allowed. Bad: <A a="1" a="2">
- Attributes are considered unordered:

  <A a="1" b="two"> is identical to <A b="two" a="1">

HTML attributes do not need to be enclosed in quotes:
<table cellpadding=10> is equivalent to <table cellpadding="10">
XHTML is does not allow the first case since quotes are always needed.

Elements vs. Attributes

- Elements can contain sub-elements
- Attributes cannot contain sub-attributes

- Two similar (but not identical) ways of expressing the same data:

```
<A a="1" b="two" c="1 and 2"/>
```

```
<A>
  <a>1</a>
  <b>two</b>
  <c>1 and 2</c>
</A>
```

Informal shorthand for attribute a of element A (but not in data):

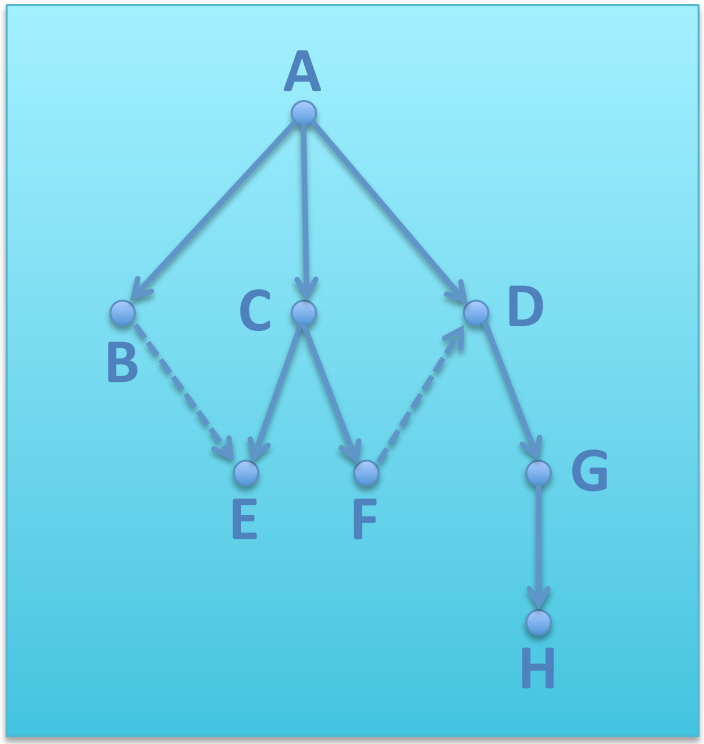
A@a

Difference between attributes and elements:

- Attribute a in the first example cannot be expanded later into sub-attributes
- Element a in the second example can be expanded later to include element contents

XML for non-tree structured data

- XML can only represent one tree hierarchy at a time.
- Non-tree data can be shoe-horned into XML data structure.



- Tree-like portions encoded as XML elements
- Non-tree connections handled by specialized id/idref/idrefs attributes.

```
<A>
    <B idref="e"/>
    <C>
        <E id="e"/>
        <F idref="d"/>
    </C>
    <D id="d">
        <G>
            <H/>
        </G>
    </D>
</A>
```

- Similar to pointers in C.

XML declaration

- Used to indicate that the following data is XML data
- First characters in file must be “<?xml” (see UTF-16 below).

<?xml version=“1.0” encoding=“UTF-8” standalone=“yes”?>

Three attributes which *must* be in this order (but optional):

@version = version of XML being used (1.0 or 1.1).
@encoding = character set being used in data. (also UTF-16 which requires two endian bytes before opening <?)
* UTF-8 is backwards compatible with 7-bit ASCII
* UTF-16 is not.
@standalone = “yes” if no external definition file, “no” if DTD (Document Type Definition) or Schema.

XML complete data file

```
<?xml version="1.0" encoding="UTF-8" standalone="yes"?>
<A>
    <B idref="e"/>
    <C>
        <E id="e"/>
        <F idref="d"/>
    </C>
    <D id="d">
        <G>
            <H/>
        </G>
    </D>
</A>
```

Even more complete data file

```
<?xml version="1.0" encoding="UTF-8" standalone="yes"?>
<!DOCTYPE A [
  <!ELEMENT A (B,C,D)>
  <!ELEMENT C (E,F)>
  <!ELEMENT D (G)>
   <!ELEMENT G (H)>
   <!ATTLIST B idref IDREF #IMPLIED>
   <!ATTLIST E id    ID    #IMPLIED>
   <!ATTLIST D id    ID    #IMPLIED>
]>
<A>
   <B idref="e"/>
   <C>
      <E id="e"/>
      <F idref="d"/>
   </C>
   <D id="d">
      <G>
         <H/>
      </G>
   </D>
</A>
```

Element A can have subelements B, C & D.

Element B can have an attribute named idref which can be set to a value which is the type IDREF.

DTD

Document Type Definition:
Describes how nodes in data can be arranged.

Data/Structure definition separation

```
<?xml version="1.0" encoding="UTF-8" standalone="yes"?>
<!DOCTYPE A SYSTEM "tree.dtd">
or <!DOCTYPE A SYSTEM "http://somewhere.com/tree.dtd">
or <!DOCTYPE A PUBLIC "-//Owner/Class Description//Language//Version" "tree.dtd">
<A>
    <B idref="e"/>
    <C>
        <E id="e"/>
        <F idref="d"/>
    </C>
    <D id="d">
        <G>
            <H/>
        </G>
    </D>
</A>
```

Formal Public Identifier

Separate file called tree.dtd:

```
<!ELEMENT A (B,C,D)>
<!ELEMENT C (E,F)>
<!ELEMENT D (G)>
<!ELEMENT G (H)>
<!ATTLIST B idref IDREF #IMPLIED>
<!ATTLIST E id    ID    #IMPLIED>
<!ATTLIST D id    ID    #IMPLIED>
```

MusicXML

https://www.musicxml.com
https://en.wikipedia.org/wiki/MusicXML

- Created around 2000 by Michael Good
- v1.0 in 2004
- v2.0 in 2007
- v3.0 in 2011

- Structure primarily derived from MuseData (covered last week)
- Some influence from Humdrum (covered next week)

- Primary intent is for data interchange between notation programs (initially Finale and Sibelius)

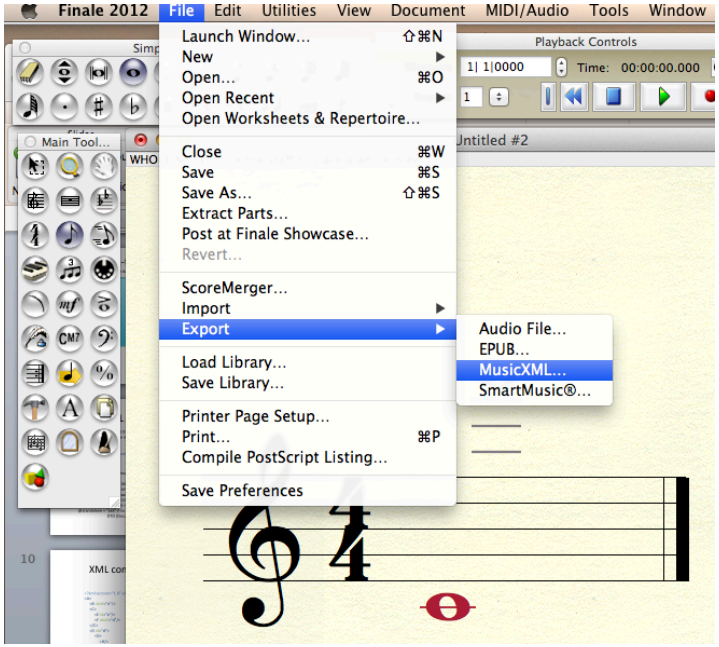
- Currently owned by MakeMusic (developer of Finale)

- DTD, XSD (schema) https://www.musicxml.com/for-developers

- Element/Attribute docs: http://usermanuals.musicxml.com/MusicXML/MusicXML.htm

MusicXML

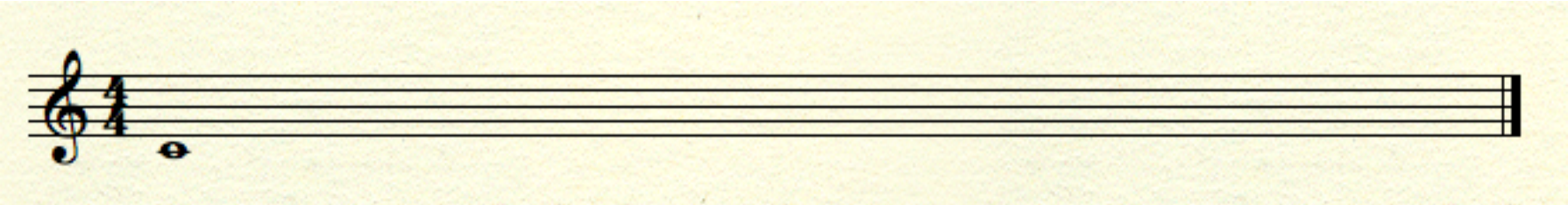
```
<?xml version="1.0" encoding="UTF-8" standalone="no"?>
<!DOCTYPE score-partwise PUBLIC "-//Recordare//DTD MusicXML 1.0 Partwise//EN"
                "http://www.musicxml.org/dtds/1.0/partwise.dtd">
<score-partwise>
  <identification>
    <encoding>
      <software>Finale 2012 for Mac</software>
      <software>Dolet Light for Finale 2012</software>
      <encoding-date>2013-01-21</encoding-date>
    </encoding>
  </identification>
  <part-list>
    <score-part id="P1">
      <part-name>MusicXML Part</part-name>
      <score-instrument id="P1-I1">
        <instrument-name>Garritan: ARIA Player</instrument-name>
      </score-instrument>
      <midi-instrument id="P1-I1">
        <midi-channel>1</midi-channel>
        <midi-bank>15489</midi-bank>
        <midi-program>1</midi-program>
      </midi-instrument>
    </score-part>
  </part-list>
  <!--======================================================-->
```



<!-- ... --> is a comment in XML

visual barline for readability

MusicXML (2)



```
<part id="P1">
  <measure number="1">
   <print/>
   <attributes>
    <divisions>2</divisions>
    <key>
     <fifths>0</fifths>
     <mode>major</mode>
    </key>
    <time>
     <beats>4</beats>
     <beat-type>4</beat-type>
    </time>
    <clef>
     <sign>G</sign>
     <line>2</line>
    </clef>
   </attributes>
   <sound tempo="120"/>
```

divisions per quarter note

```
    <note default-x="86">
      <pitch>
       <step>C</step>
       <octave>4</octave>
      </pitch>
      <duration>8</duration>
      <voice>1</voice>
      <type>whole</type>
     </note>
     <barline location="right">
      <bar-style>light-heavy</bar-style>
     </barline>
    </measure>
   </part>
   <!--=========================================================-->
</score-partwise>
```

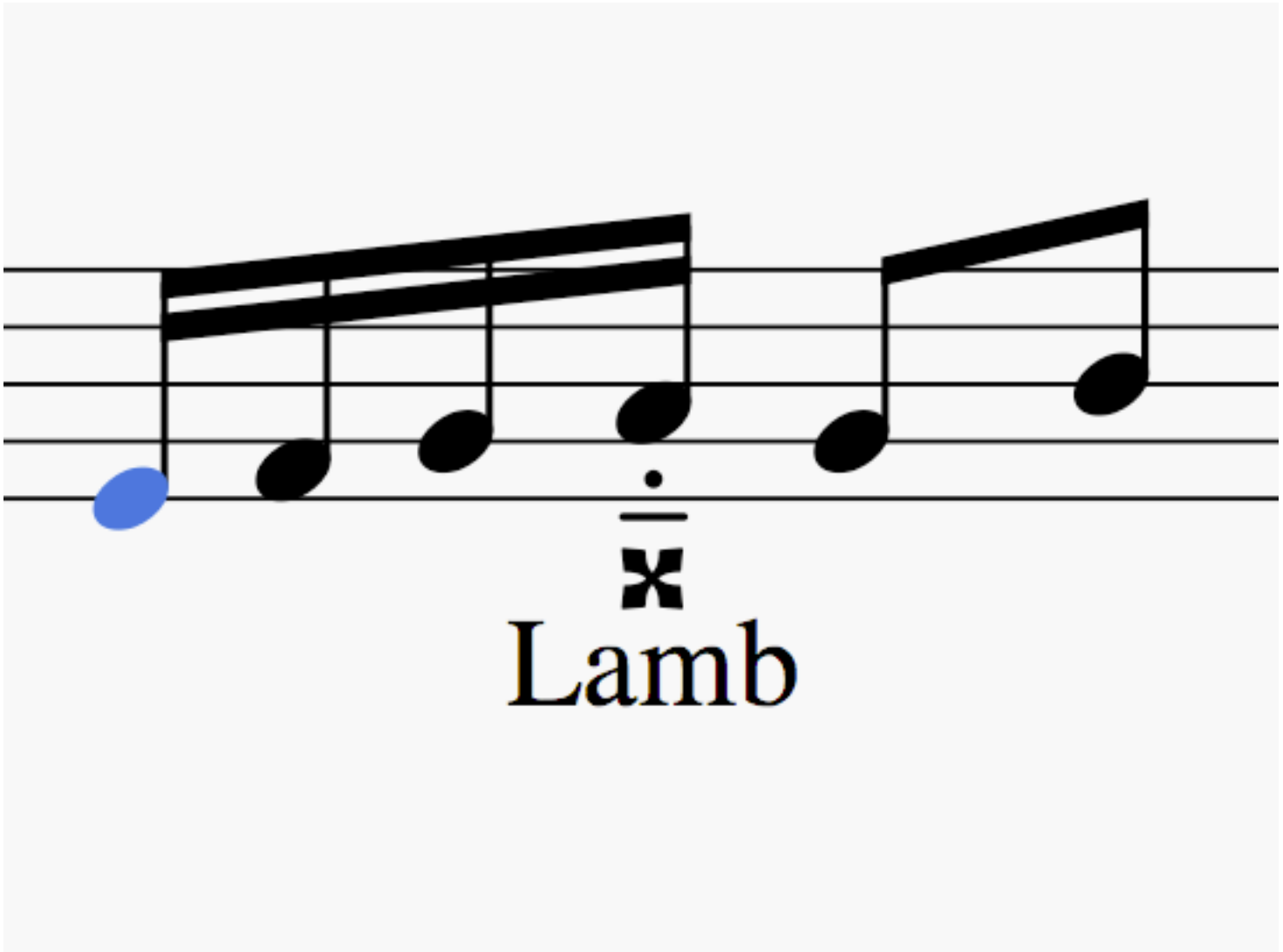
4 quarter notes

looks like a whole note

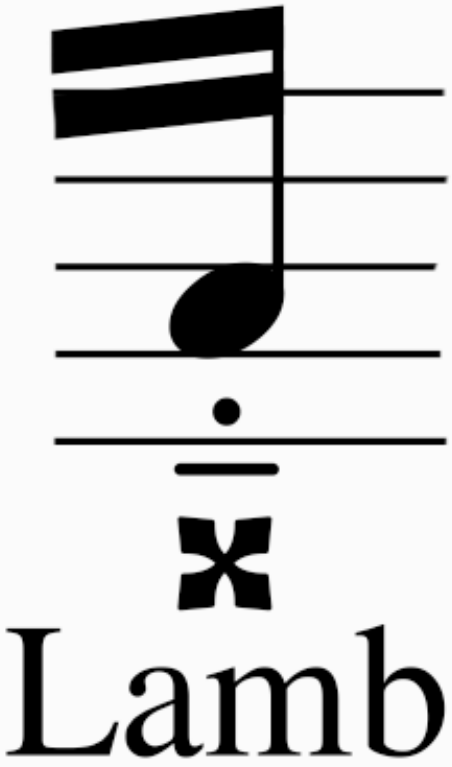
Compare to GUIDO (inScore):
[c/1]

Compare to Humdrum:
**kern
*M4/4
1c
==
*-

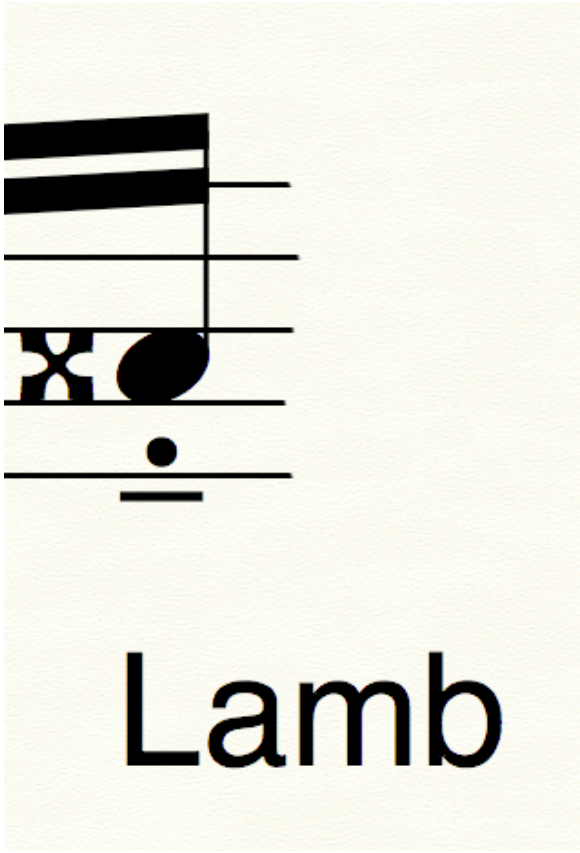
Data Interchange



MusicXML Note parameters




```
<note default-x="165.98" default-y="-25.00">
    <pitch>
        <step>A</step>
        <alter>2</alter>
        <octave>4</octave>
    </pitch>
    <duration>1</duration>
    <voice>1</voice>
    <type>16th</type>
    <accidental>double-sharp</accidental>
    <stem>up</stem>
    <beam number="1">end</beam>
    <beam number="2">end</beam>
    <notations>
        <articulations>
        <detached-legato/>
        </articulations>
    </notations>
    <lyric number="1">
        <syllabic>single</syllabic>
        <text>Lamb</text>
        </lyric>
</note>
```



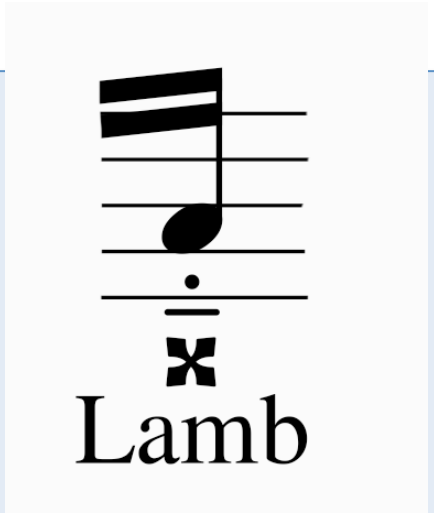
MuseScore → **Finale**

MuseScore to Finale

```
<note default-x="165.98" default-y="-25.00">
      <pitch>
       <step>A</step>
       <alter>2</alter>
       <octave>4</octave>
       </pitch>
      <duration>1</duration>
      <voice>1</voice>
      <type>16th</type>
      <accidental>double-sharp</accidental>
      <stem>up</stem>
      <beam number="1">end</beam>
      <beam number="2">end</beam>
      <notations>
       <articulations>
        <detached-legato/>
        </articulations>
       </notations>
      <lyric number="1">
       <syllabic>single</syllabic>
       <text>Lamb</text>
       </lyric>
      </note>
```

Output from MuseScore

```
<note default-x="180">
      <pitch>
       <step>A</step>
       <alter>2</alter>
       <octave>4</octave>
      </pitch>
      <duration>1</duration>
      <voice>1</voice>
      <type>16th</type>
      <accidental>double-sharp</accidental>
      <stem default-y="10">up</stem>
      <beam number="1">end</beam>
      <beam number="2">end</beam>
      <notations>
       <articulations>
        <detached-legato default-x="1" default-y="-44" placement="below"/>
       </articulations>
      </notations>
      <lyric default-y="-80" number="1">
       <syllabic>single</syllabic>
       <text font-family="FreeSerif" font-size="10.8">Lamb</text>
      </lyric>
     </note>
```



Output from Finale

MEI

http://www.music-encoding.org
https://en.wikipedia.org/wiki/Music_Encoding_Initiative

- Created around 2000 by Perry Roland (University of Virginia)

- Structure primarily derived from TEI (Text Encoding Initiative)
- Some influence from Humdrum (covered next week)

- Primary intent is for digital critical (scholarly) editions
- Focus on modern notation, mensural notation, and chant notation

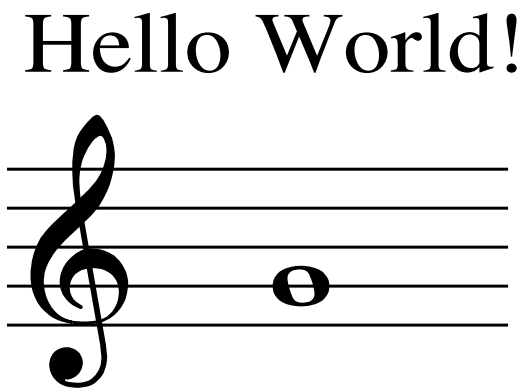
- Currently managed by MEI Board (hosted by the Academy of Sciences and Literature, Mainz, Germany)
  http://www.akademienunion.de/en/adw-mainz

- Hosts annual conference (Music Encoding Conference)
  This year in Tours, France

- Schema (no DTD): https://github.com/music-encoding/music-encoding

- Element/Attribute docs: http://music-encoding.org/documentation/3.0.0/elements

MEI example




```
<mei version="1.7b">
  <meihead>
    <meiid>20071029101306082</meiid>
    <filedesc>
      <titlestmt>
        <title>Hello World!</title>
      </titlestmt>
      <pubstmt/>
    </filedesc>
  </meihead>
  <work>
    <music>
      <mdiv>
        <score>
          <scoredef meter.count="4" meter.unit="4" key.sig="0">
            <staffgrp>
              <staffdef n="1" id="P1" label.full="Music" clef.line="2" clef.shape="G" midi.div="1" key.sig="0"
            </staffgrp>
          </scoredef>
          <section>
            <scoredef meter.count="4" meter.unit="4" key.sig="0"/>
            <measure n="1" id="d1e6">
              <staff>
                <layer>
                  <note id="d1e24" tstamp="0" pname="c" oct="4" dur="1" dur.ges="4"/>
                </layer>
              </staff>
            </measure>
          </section>
        </score>
      </mdiv>
    </music>
  </work>
</mei>
```

Utilizes attributes more than MusicXML (so looks more condensed)

Hierarchy used more than MusicMXL

Heavy use of IDs (none/little in MusicXML)

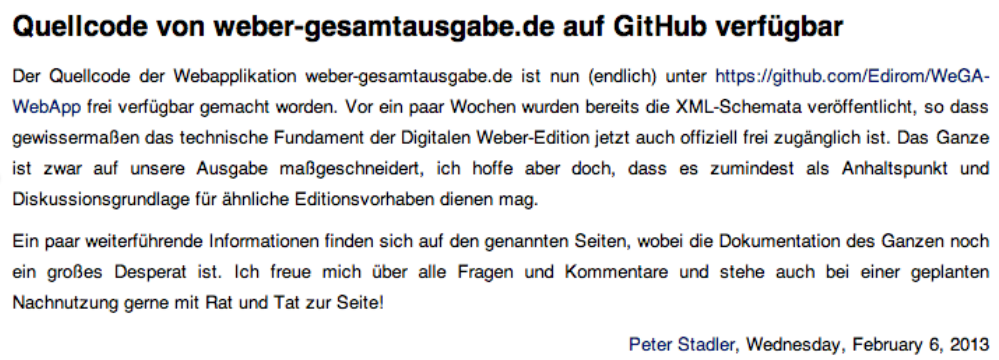
TEI

- MEI is modeled after the Text Encoding Initiative: http://www.tei-c.org/index.xml

  “a consortium which collectively develops and maintains a standard for the representation of texts in digital form.”

```
<TEI xmlns='http://www.tei-c.org/ns/1.0' xmlns:xml='http://www.w3.org/XML/1998 namespace'
xml:id="A050153">
<teiHeader>
<fileDesc>
<titleStmt>
<title level="s">Aktuelle Nachrichten der Carl-Maria von Weber-Gesamtausgabe</title> <title
level="a">Quellcode von weber-gesamtausgabe.de auf GitHub verfügbar</title> <author
key="A009001">Peter Stadler</author>
</titleStmt> <publicationStmt>
<date when="2013-02-06T12:02:00"/>
</publicationStmt> <sourceDesc>
<p>born digital</p>
</sourceDesc>
</fileDesc> <profileDesc>
<textClass>
<keywords scheme="WeGA_cat">
<term>announcement</term>
</keywords>
</textClass>
</profileDesc>
</teiHeader> <text type="news">
<body>
<div xmlns:xml='http://www.w3.org/XML/1998/namespace' xml:lang="de">
<p>
Der Quellcode der Webapplikation weber-gesamtausgabe.de ist nun (endlich) unter <ref
target="https://github.com/Edirom/WeGA-WebApp">https://github.com/Edirom/WeGA-
WebApp</ref> frei verfügbar gemacht worden. <rs type="news" key="A050256">Vor ein paar
Wochen wurden bereits die XML-Schemata veröffentlicht</rs>, so dass gewissermaßen das
technische Fundament der Digitalen Weber-Edition jetzt auch offiziell frei zugänglich ist. Das
Ganze ist zwar auf unsere Ausgabe maßgeschneidert, ich hoffe aber doch, dass es zumindest als
Anhaltspunkt und Diskussionsgrundlage für ähnliche Editionsvorhaben dienen mag.
</p> <p>Ein paar weiterführende Informationen finden sich auf den genannten Seiten, wobei die
Dokumentation des Ganzen noch ein großes Desperat ist. Ich freue mich über alle Fragen und
Kommentare und stehe auch bei einer geplanten Nachnutzung gerne mit Rat und Tat zur Seite!</
p>
</div>
</body>
</text>
</TEI>
```

rendering



Quellcode von weber-gesamtausgabe.de auf GitHub verfügbar

Der Quellcode der Webapplikation weber-gesamtausgabe.de ist nun (endlich) unter https://github.com/Edirom/WeGA-WebApp frei verfügbar gemacht worden. Vor ein paar Wochen wurden bereits die XML-Schemata veröffentlicht, so dass gewissermaßen das technische Fundament der Digitalen Weber-Edition jetzt auch offiziell frei zugänglich ist. Das Ganze ist zwar auf unsere Ausgabe maßgeschneidert, ich hoffe aber doch, dass es zumindest als Anhaltspunkt und Diskussionsgrundlage für ähnliche Editionsvorhaben dienen mag.

Ein paar weiterführende Informationen finden sich auf den genannten Seiten, wobei die Dokumentation des Ganzen noch ein großes Desperat ist. Ich freue mich über alle Fragen und Kommentare und stehe auch bei einer geplanten Nachnutzung gerne mit Rat und Tat zur Seite!

Peter Stadler, Wednesday, February 6, 2013

- HTML on steroids
- Database format which can be transformed into HTML

http://www.weber-gesamtausgabe.de/en/A009001/News/A050153

Formal Description/Documentation

http://music-encoding.org/support/guidelines

Currently three components:

- mei-CMN (Common western Music Notation)
- mei-Mensural (precursor to CMN)
- mei-Neumes (precursor to mensural notation)

- Element Tag Documentation:

  http://music-encoding.org/documentation/3.0.0/chapters

  http://music-encoding.org/documentation/3.0.0/elements

DTD/Schema/RelaxNG/ODD

- Method to verify structure of XML and, to some degree, content

DTD: http://en.wikipedia.org/wiki/Document_Type_Definition
http://www.w3schools.com/dtd/dtd_intro.asp

- Original method for formal description of XML file structure (XML 1.0).

Schema: http://en.wikipedia.org/wiki/XML_Schema_(W3C)`

- 2001: Schema is also in XML format, a successor of DTDs
- XSD (XML Schema Definition)
- More data typing than DTDs
- Namespaces, such as “xml:id”

RelaxNG: http://en.wikipedia.org/wiki/RELAX_NG

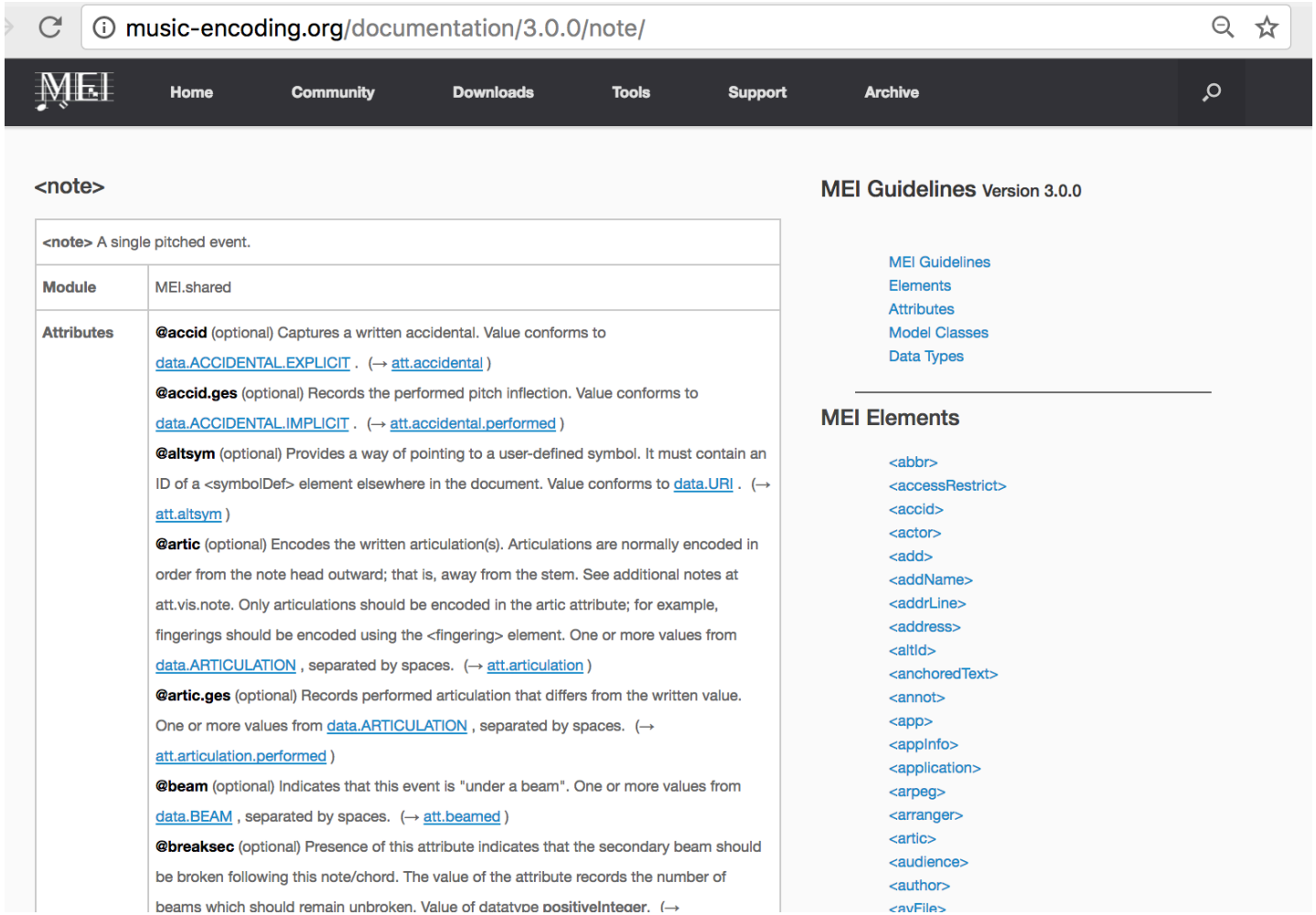
- REgular LAnguage for Xml Next Generation
- 2009

ODD: TEI’s meta representation to automatically generate Schema or RelaxNG format description.

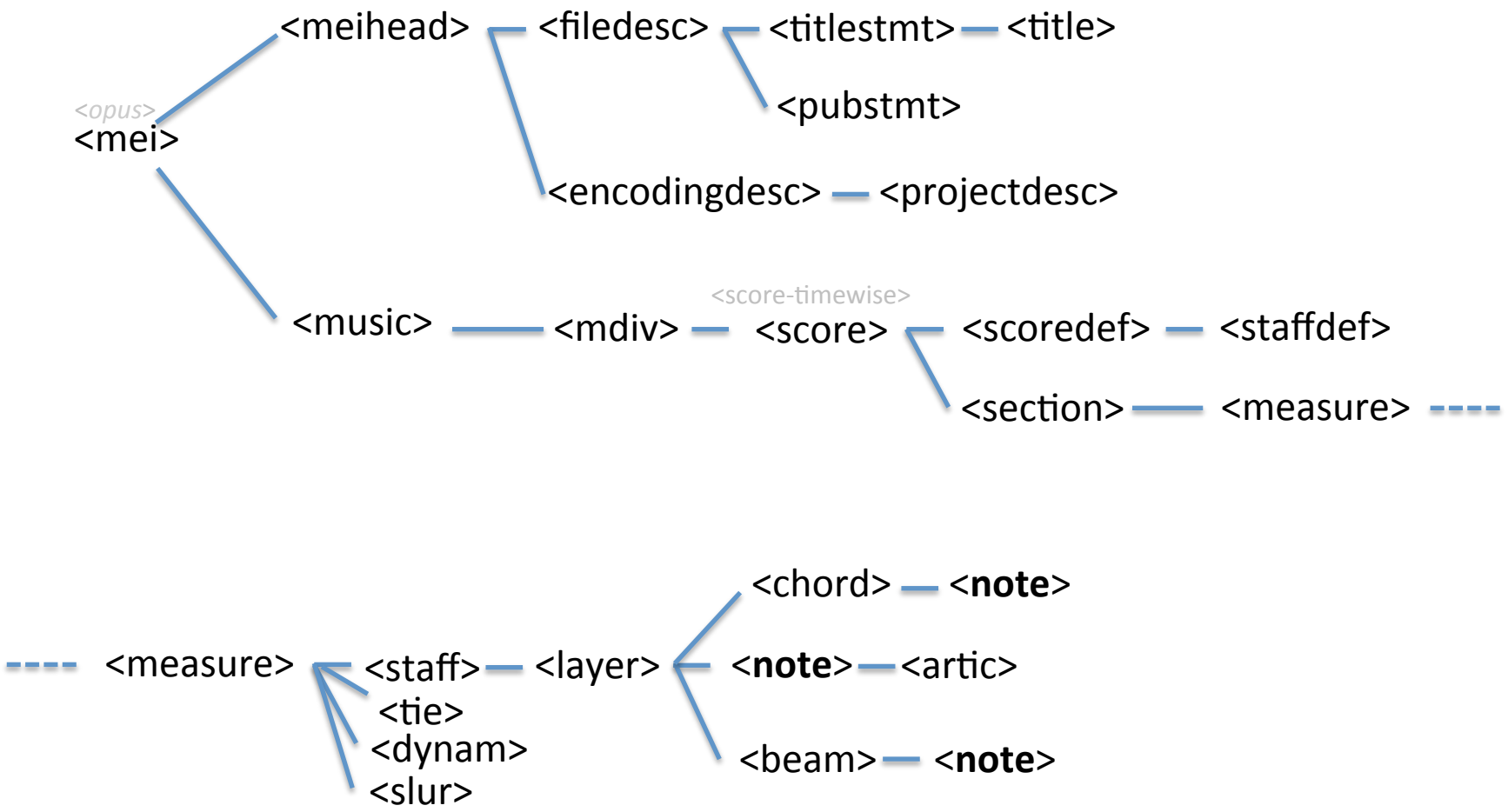
Documentation

http://music-encoding.org/documentation/3.0.0/chapters

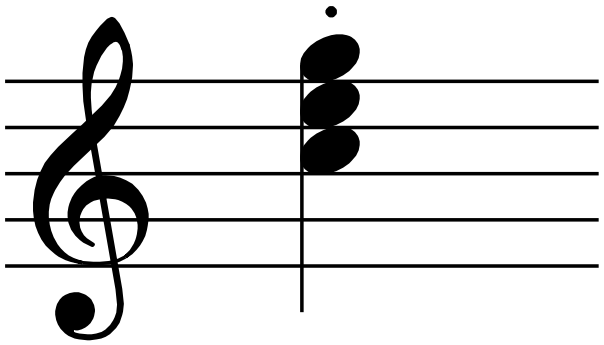
http://music-encoding.org/documentation/3.0.0/elements



Basic tree structure of MEI



Chords



MEI

```
<chord xml:id="d11e1" dur="4" dur.ges="1" stem.dir=”down">
  <artic value="stacc"/>
  <note xml:id="d1e85"   pname="g" oct=“5"/>
  <note xml:id="d1e102" pname="e" oct=“5"/>
  <note xml:id="d1e118" pname="c" oct=“5"/>
</chord>
```

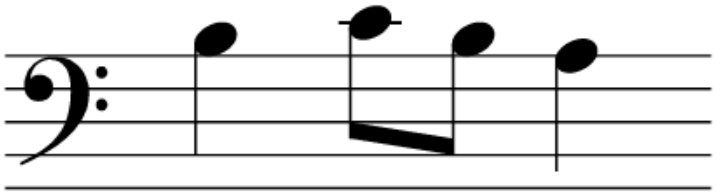
MuseData

```
G5      1       1 q     d               .
 E5     1       1 q     d
 C5     1       1 q     d
```

MusicXML

```
<note default-x="84">
  <pitch>
    <step>C</step>
    <octave>5</octave>
  </pitch>
  <duration>2</duration>
  <voice>1</voice>
  <type>quarter</type>
  <stem default-y="-50.5">down</stem>
  <notations>
    <articulations>
      <staccato default-x="3" default-y="15" placement="above"/>
    </articulations>
  </notations>
</note>
<note default-x="84">
  <chord/>
  <pitch>
    <step>E</step>
    <octave>5</octave>
  </pitch>
  <duration>2</duration>
  <voice>1</voice>
  <type>quarter</type>
  <stem>down</stem>
</note>
<note default-x="84">
  <chord/>
  <pitch>
    <step>G</step>
    <octave>5</octave>
  </pitch>
  <duration>2</duration>
  <voice>1</voice>
  <type>quarter</type>
  <stem>down</stem>
</note>
```

Beams



MEI

```
<note xml:id="n_sc_14_0" pname="b" oct="3" dur="4"/>
<beam>
        <note xml:id="n_sc_15_0" pname="c" oct="4" dur="8"/>
        <note xml:id="n_sc_16_0" pname="b" oct="3" dur="8"/>
</beam>
<note xml:id="n_sc_17_0" pname="a" oct="3" dur="4"/>
```

MuseData

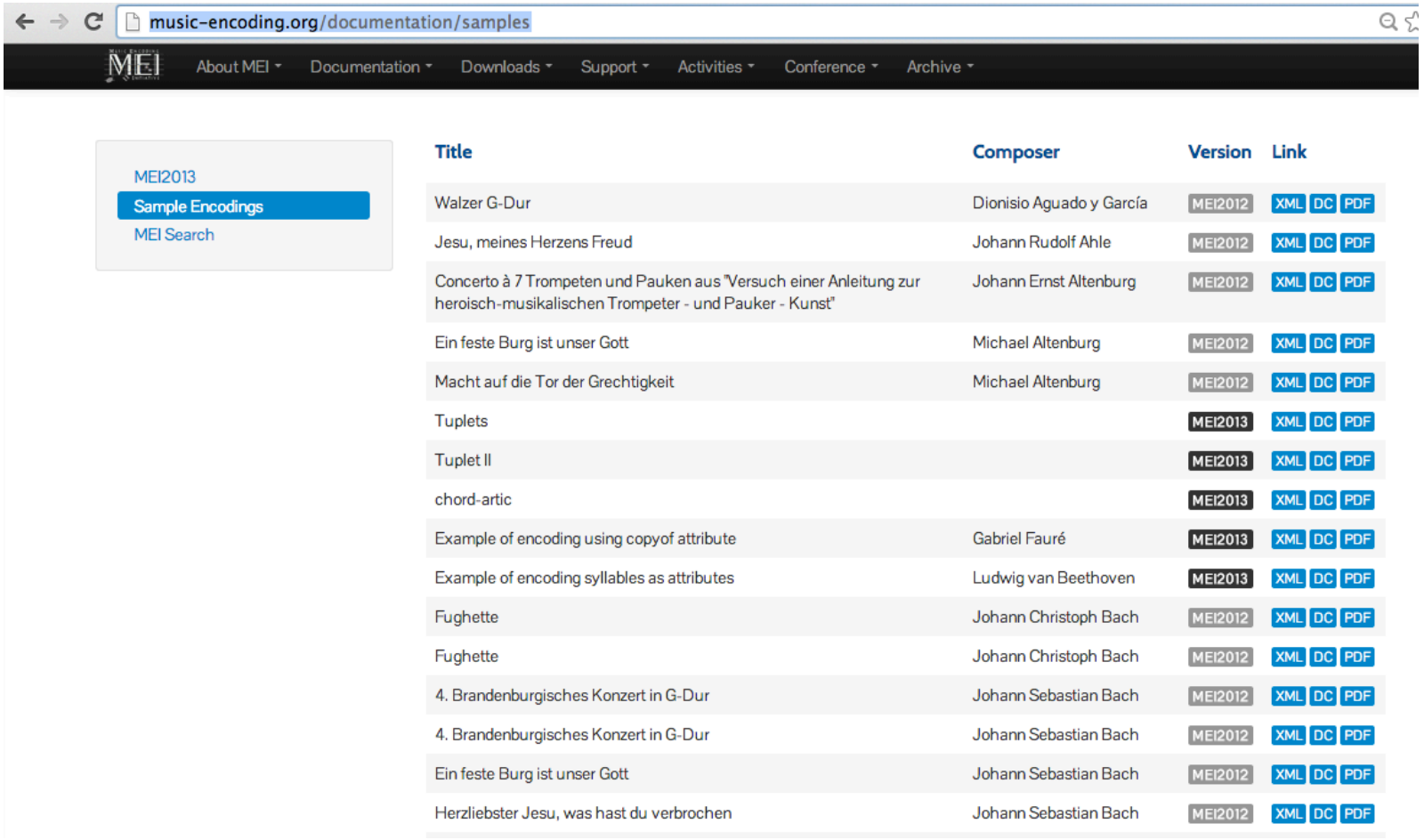
```
B3      2       1 q     d
C4      1       1 e     d       [
B3      1       1 e     d       ]
A3      2       1 q     d
```

MusicXML

```
<note>
        <pitch>
                <step>B</step>
                <octave>3</octave>
        </pitch>
        <duration>2</duration>
        <voice>1</voice>
        <type>quarter</type>
        <stem>down</stem>
</note>
<note>
        <pitch>
                <step>C</step>
                <octave>4</octave>
        </pitch>
        <duration>1</duration>
        <voice>1</voice>
        <type>eighth</type>
        <stem>down</stem>
        <beam number="1">begin</beam>
</note>
<note>
        <pitch>
                <step>B</step>
                <octave>3</octave>
        </pitch>
        <duration>1</duration>
        <voice>1</voice>
        <type>eighth</type>
        <stem>down</stem>
        <beam number="1">end</beam>
</note>
<note>
        <pitch>
                <step>A</step>
                <octave>3</octave>
        </pitch>
        <duration>2</duration>
        <voice>1</voice>
        <type>quarter</type>
        <stem>down</stem>
</note>
```

MEI data on the web

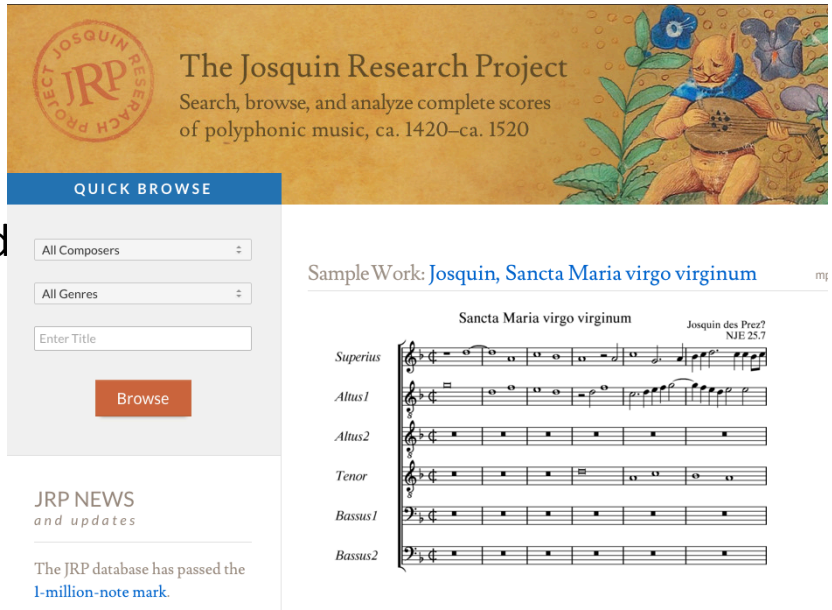
http://music-encoding.org/downloads/encodings
https://github.com/music-encoding/sample-encodings

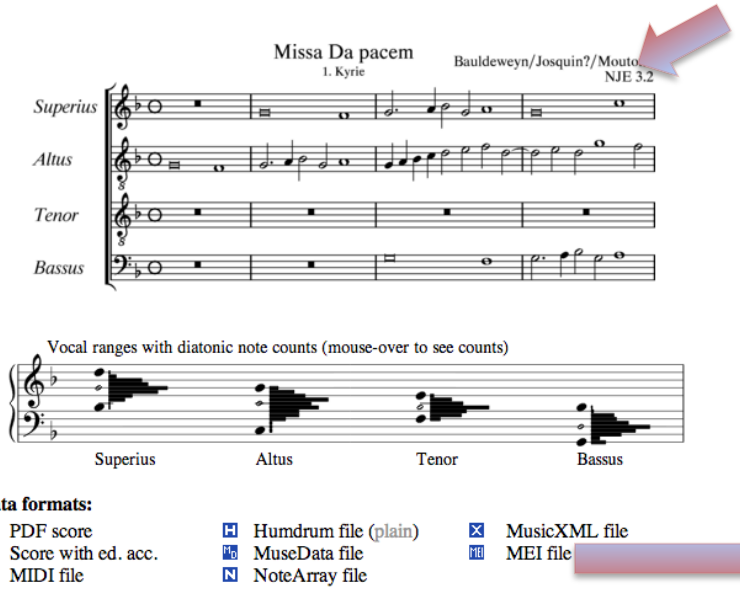


MEI data on the web

http://jrp.ccarh.org

- JRP: database of music from the early Renaissance (1420-1520)
- Data available in Humdrum (primary format), MIDI, MuseData, MusicXML and MEI.
- Primarily Josquin des Prez
- Currently 1,000,000+ notes/1,000 works






```
<measure n="1" xml:id="mx_sc_1">
  <staff n="1">
   <layer n="1">
    <rest xml:id="n_sc_29_3" dur="breve" dots="1"/>
   </layer>
  </staff>
  <staff n="2">
   <layer n="1">
    <note xml:id="n_sc_29_2" pname="g" oct="3" dur="breve"/>
   </layer>
  </staff>
  <staff n="3">
   <layer n="1">
    <rest xml:id="n_sc_29_1" dur="breve" dots="1"/>
   </layer>
  </staff>
  <staff n="4">
   <layer n="1">
    <rest xml:id="n_sc_29_0" dur="breve" dots="1"/>
   </layer>
  </staff>
</measure>
```

MEI data on the web (2)

http://kern.ccarh.org/browse?l=371chorales

KernScores

Local Search: Pitch anchored

top>users>craig>classical>bach>**371chorales>**

Four-part chorales collected after J.S. Bach's death by his son C.P.E. Bach (and finished by Kirnberger, J.S. Bach student, after C.P.E. Bach's death). Ordered by Breitkopf & Härtel numbers, and includes all chorales except #150 which is not 4-part. First complete edition by Breitkopf & Härtel from 1784–1787 in four volumes. [First incomplete edition consisting of 200 chorales in two volumes by Friedrich Wilhelm Birnstiel in 1765 & 1769 which was reprinted in 1975 by Georg Olms]. This digital edition is referenced against the fourth edition of the chorales by Breitkopf & Härtel, *c.* 1875:

371 vierstimmige Choralgesänge von Johann Sebastian Bach. 4th ed. by Alfred Dörffel. Breitkopf & Härtel, Leipzig [*c.* 1875]. 178 pp. Plate Number: V.A.10. Retypeset *c.* 1915 as Edition Breitkopf 10. Reprinted by Associated Music Publishers, Inc., New York [*c.* 1940].

Scans of the source edition can be viewed by clicking on the S button to the left of each chorale title. See this chorale bibliography at the Riemenschneider Bach Institute at Baldwin Wallace College for a good publication history of the Bach chorales. See also this article: *The History of the Breitkopf Collection of J.S. Bach's Four-Part Chorales* by Thomas Braatz. Click on the Z button below to download all Humdrum files in a single ZIP file.

Z S All chorales in grand-staff notation (177 pages) [7.8 MB]
S All chorales in vocal-score notation (254 pages) [8.8 MB]
S H M K 1. Aus meines Herzens Grunde, BWV 269
S H M K 2. Ich dank dir, lieber Herre, BWV 347
S H M K 3. Ach Gott vom Himmel sieh darein, BWV 153/1
S H M K 4. Es ist das Heil uns kommen her, BWV 86/6
S H M K 5. An Wasserflüssen Babylon, BWV 267
S H M K 6. Christus, der ist mein Leben, BWV 281

http://kern.ccarh.org/data?file=chor001.krn&l=371chorales&format=info

KernScores

1. Aus meines Herzens Grunde, BWV 269

Location	top>users>craig>classical>bach>371chorales	
Humdrum file	chor001.krn E [expanded repeats E] [no repeats E]	
Composer	Bach, Johann Sebastian	
Composer's dates	21 Feb 1685 - 28 Jul 1750	
Title: orig. lang.: German	Aus meines Herzens Grunde	
Title: English	From the Depths of My Heart	
Data Format	PDF Score	chor001.pdf
Translations	*Standard MIDI File*:	chor001.mid [without repeats]
	Director Musices:	chor001.mus
	Melisma Format:	chor001.notes
	MusicXML:	chor001.xml
	STK/SKINI:	chor001.ski
	Guido:	chor001.gmn [notation via noteserver.org]
	ABC+:	chor001.abc [notation via abcm2ps] [number every bar]
	MuseData:	chor001.md2 [notation via muse2ps]
	SA Sonorities:	chor001.dat
	MEI:	chor001.mei

http://kern.ccarh.org/sdata?l=371chorales&file=chor001.krn&f=mei

```
<?xml version="1.0" encoding="UTF-8" standalone="no"?>
<?oxygen SCHSchema="http://music-encoding.org/mei/schemata/2010-05/rng/mei-all.rng"?>
<?oxygen RNGSchema="http://music-encoding.org/mei/schemata/2010-05/rng/mei-all.rng"
   type="xml"?>
<mei xmlns:xlink="http://www.w3.org/1999/xlink" xmlns="http://www.music-encoding.org/ns/
mei" meiversion="2010-05">
 <meihead>
  <filedesc>
   <titlestmt>
    <title type="main" xml:lang="ger">Aus meines Herzens Grunde</title>
    <title type="translated" xml:lang="eng">From the Depths of My Heart</title>
   </titlestmt>
   <pubstmt/>
  </filedesc>
  <profiledesc>
   <langusage>
    <language xml:id="eng" authority="iso639-2"/><!-- English -->
    <language xml:id="ger" authority="iso639-2"/><!-- German -->
   </langusage>
  </profiledesc>
</meihead>
 <music>
  <body>
   <mdiv>
    <score>
     <scoredef key.sig="1s" key.pname="g" key.accid="n" key.mode="major" meter.count="3"
       meter.unit="4">
      <staffgrp>
       <staffdef n="1" clef.shape="G" clef.line="2"/>
       <staffdef n="2" clef.shape="G" clef.line="2"/>
       <staffdef n="3" clef.shape="G" clef.line="2" clef.trans="8vb"/>
       <staffdef n="4" clef.shape="F" clef.line="4"/>
      </staffgrp>
      <!-- <secexpan repeat="true" label="default" ids="A A B"/> -->
      <!-- <secexpan repeat="false" label="norep" ids="A B"/> -->
     </scoredef>
     <section xml:id="A">
      <measure xml:id="mx_sc_13">
       <staff n="1">
        <layer n="1">
         <note xml:id="n_sc_19_3" pname="g" oct="4" dur="4"/>
        </layer>
       </staff>
       <staff n="2">
        <layer n="1">
         <note xml:id="n_sc_19_2" pname="d" oct="4" dur="4"/>
        </layer>
       </staff>
       <staff n="3">
        <layer n="1">
         <note xml:id="n_sc_19_1" pname="b" oct="3" dur="4"/>
        </layer>
       </staff>
```

The Music Encoding Conference 2015

18-21 May, 2015

Florence, Italy

Music encoding is now a prominent feature of various areas in musicology and music librarianship. The encoding of symbolic music data provides a foundation for a wide range of scholarship, and over the last several years, has garnered a great deal of attention in the digital humanities. This conference intends to provide an overview of the current state of data modeling, generation, and use, and aims to introduce new perspectives on topics in the fields of traditional and computational musicology, music librarianship, and scholarly editing, as well as in the broader area of digital humanities.

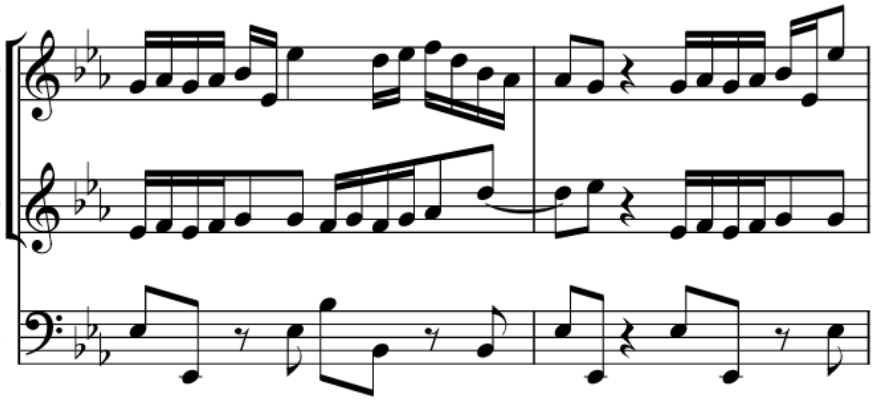
This conference aims to gather specialists in all the above areas, to discuss the current state of modeling, generation and use of music encoding, to exchange experiences, report on successful projects on major collections and composers, and to forge collaborations for future projects.

The program opens on Monday, May 18th with a pre-conference day devoted to workshops/tutorials on MEI and its application to scholarly publication, followed by two days of papers and poster presentations covering various theoretical and practical issues in research and publishing. The program is completed by an "Unconference Day" on Thursday, May 21: an opportunity for everyone interested in using and improving MEI — developers, librarians, musicologists, editors, publishers — to investigate the topics they're most interested in.

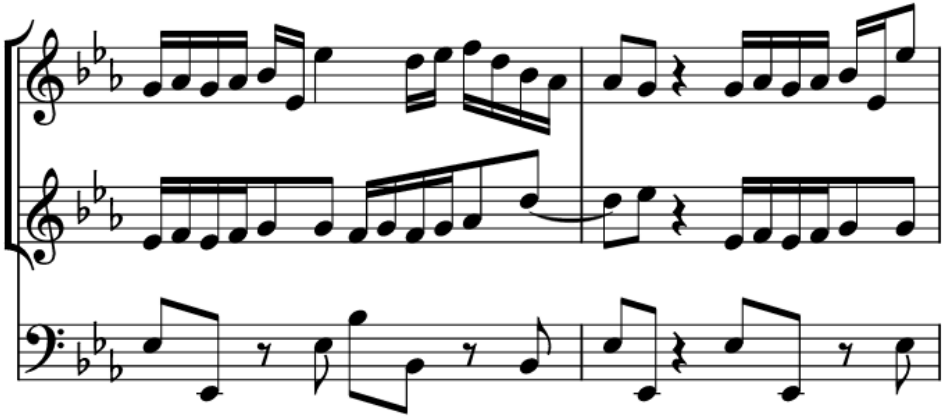
Verovio

http://www.verovio.org

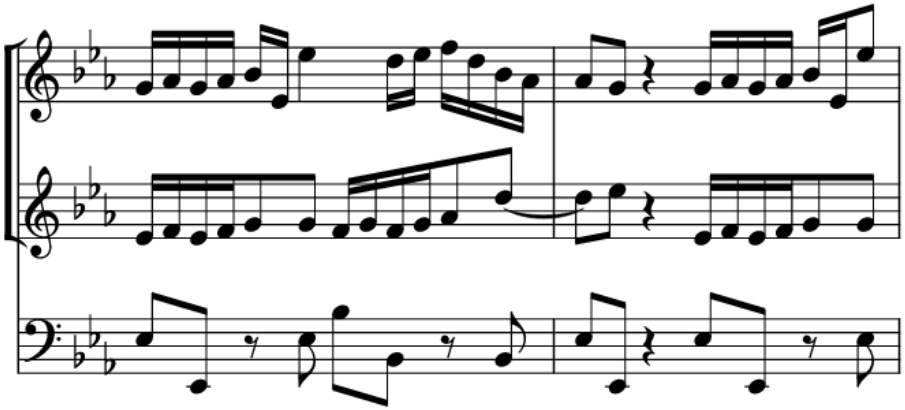
Leipzig



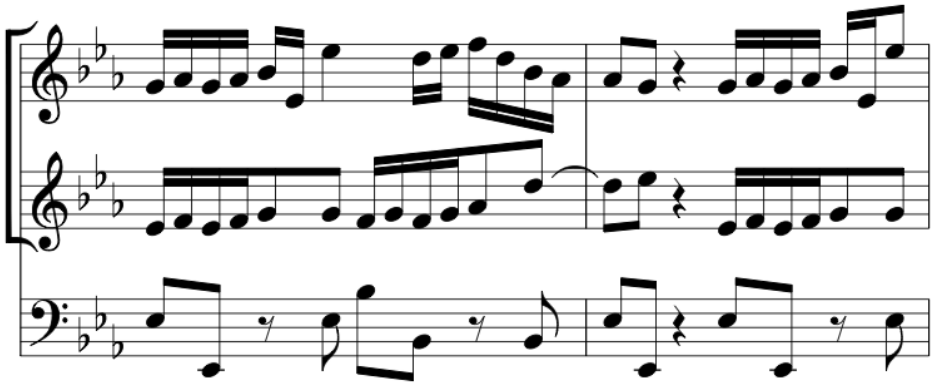
Bravura



Gootville



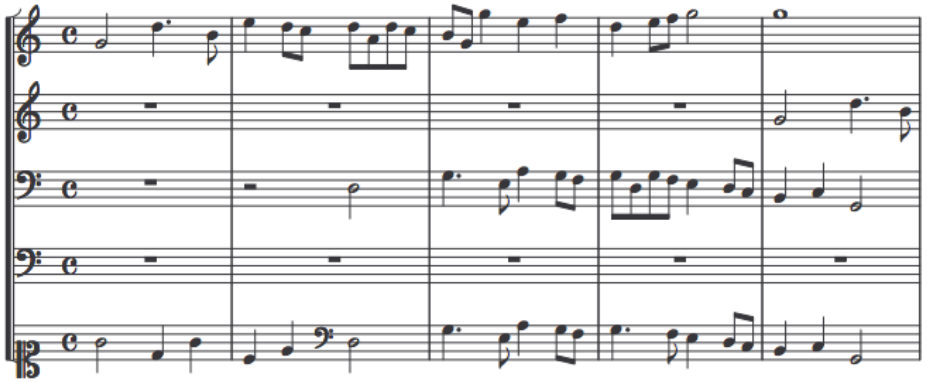
SCORE

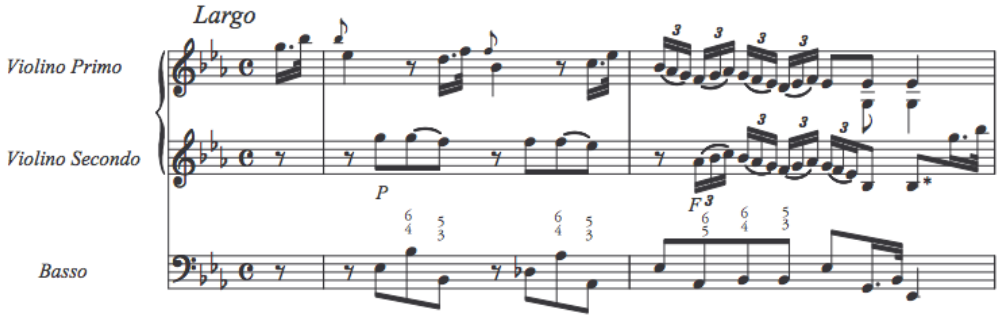


http://rism-ch.github.io/verovio/smufl.xhtml

Wolfgang

Wolfgang est développé dans le cadre de l'Université de Genève par Etienne Darbellay, musicologue et informaticien.





Wolfgang supporte désormais l'importation de fichiers au format GUIDO. Cette fonction permet l'échange avec d'autres applications (logiciels de reconnaissance de musique ou autres logiciels d'édition).

http://www.winwg.com/presentation/exemples.shtml

Verovio (2)

Verovio (mostly) preserves the MEI structure in SVG rendering

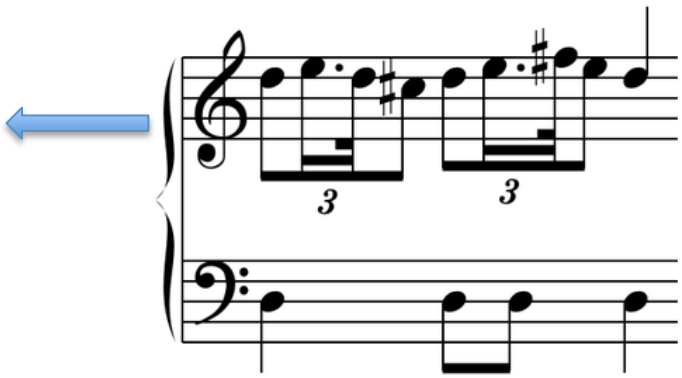
MEI

```
<tuplet xml:id="t1" num="3" numbase="2">
  <beam xml:id="b1">
    <note xml:id="n1" pname="d" oct="5" dur="8" />
    <note xml:id="n2" pname="e" oct="5" dur="16" dots="1"/>
    <note xml:id="n3" pname="d" oct="5" dur="32" />
    <note xml:id="n4" pname="c" oct="5" dur="8" accid="s"/>
  </beam>
</tuplet>
<beam xml:id="b2">
  <tuplet xml:id="t2" num="3" numbase="2">
    <note xml:id="n5" pname="d" oct="5" dur="8" />
    <note xml:id="n6" pname="e" oct="5" dur="16" dots="1"/>
    <note xml:id="n7" pname="f" oct="5" dur="32" accid="s"/>
    <note xml:id="n8" pname="e" oct="5" dur="8"/>
  </tuplet>
</beam>
```

SVG

```
<g class="tuplet" id="svg-t1" >
  <g class="beam" id="svg-b1" >
    <g class="note" id="svg-n1" >...</g>
    <g class="note" id="svg-n2" >...</g>
    <g class="note" id="svg-n3" >...</g>
    <g class="note" id="svg-n4" >...</g>
  </g>
</g>
<g class="beam" id="svg-b2" >
  <g class="tuplet" id="svg-t2" >
    <g class="note" id="svg-n5" >...</g>
    <g class="note" id="svg-n6" >...</g>
    <g class="note" id="svg-n7" >...</g>
    <g class="note" id="svg-n8" >...</g>
  </g>
</g>
```

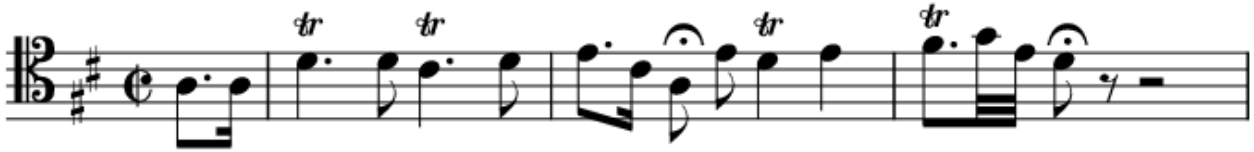
Former Leipzig treble clef



http://rism-ch.github.io/verovio/structure.xhtml

Verovio (3)

RISM / Plaine & Easie code

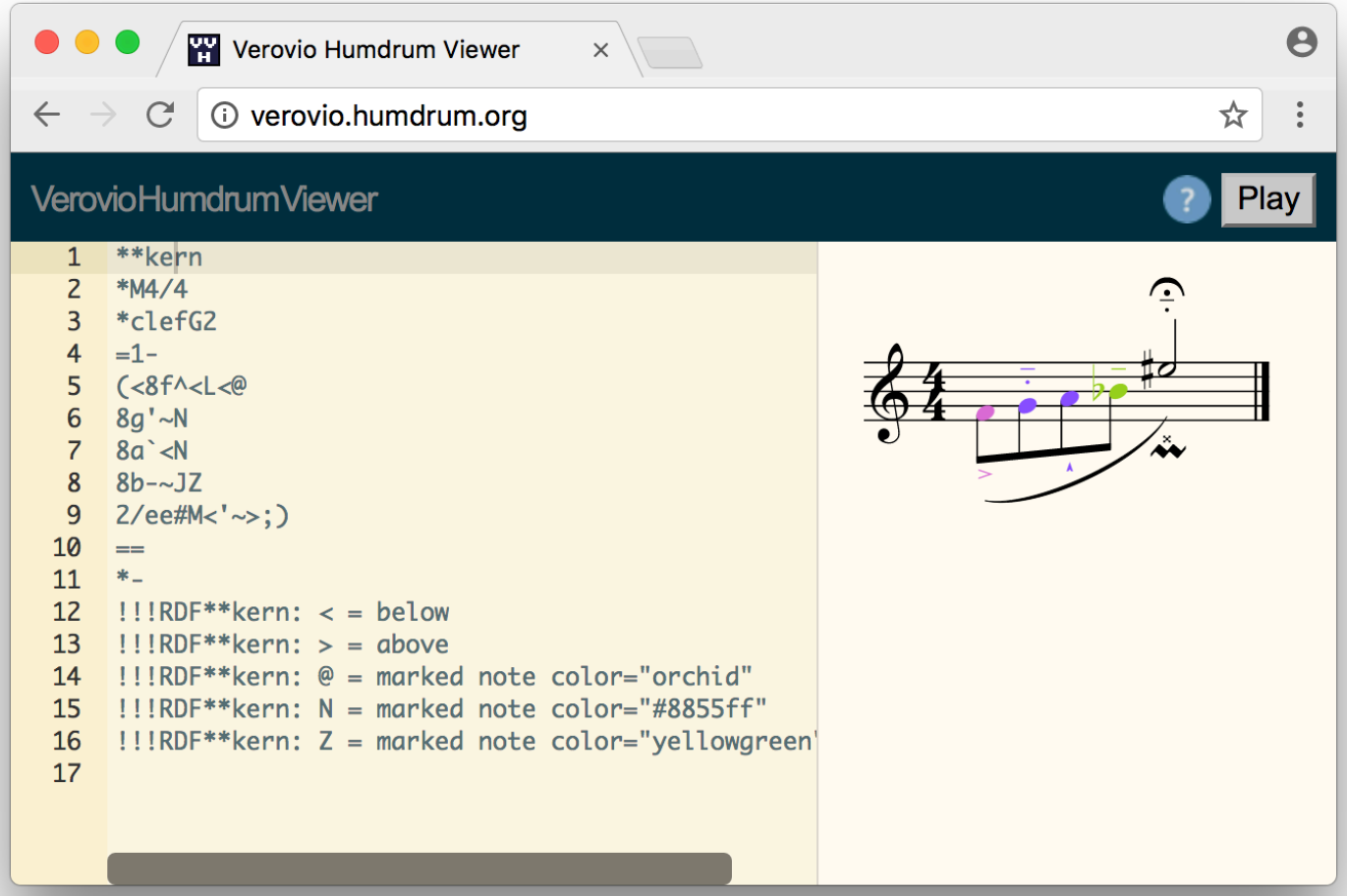


```
@clef:C-4
@keysig:xFC
@timesig:c/
@data:,{8.A6A}/'4.Dt8D4.Ct8D/{8.E6C},8(A)'E4DtE/{8.Ft3GE}8(D)-2-/
```

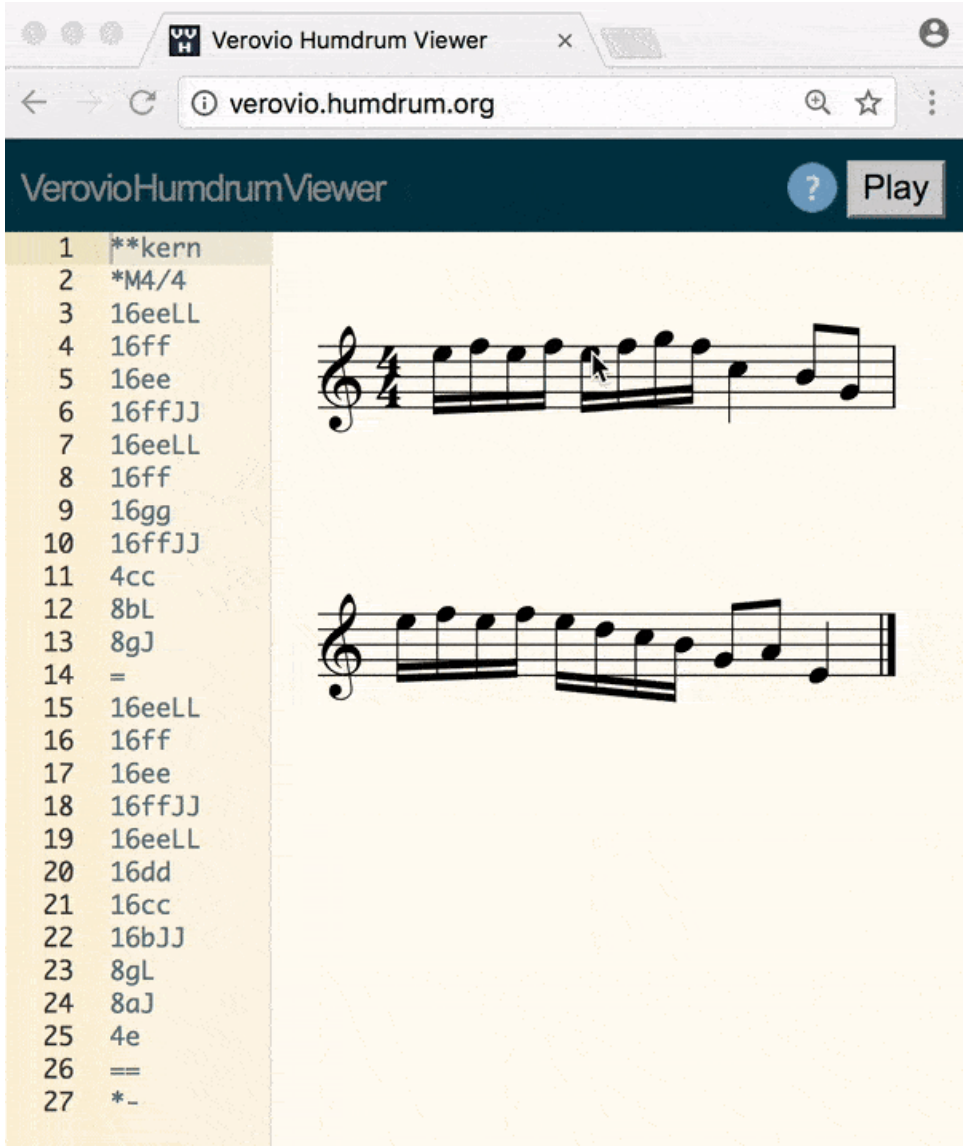
http://rism-ch.github.io/verovio/pae-examples.xhtml

Verovio Humdrum Viewer

- Front-end for Humdrum data viewing/editing
- Back-end is MEI/Verovio

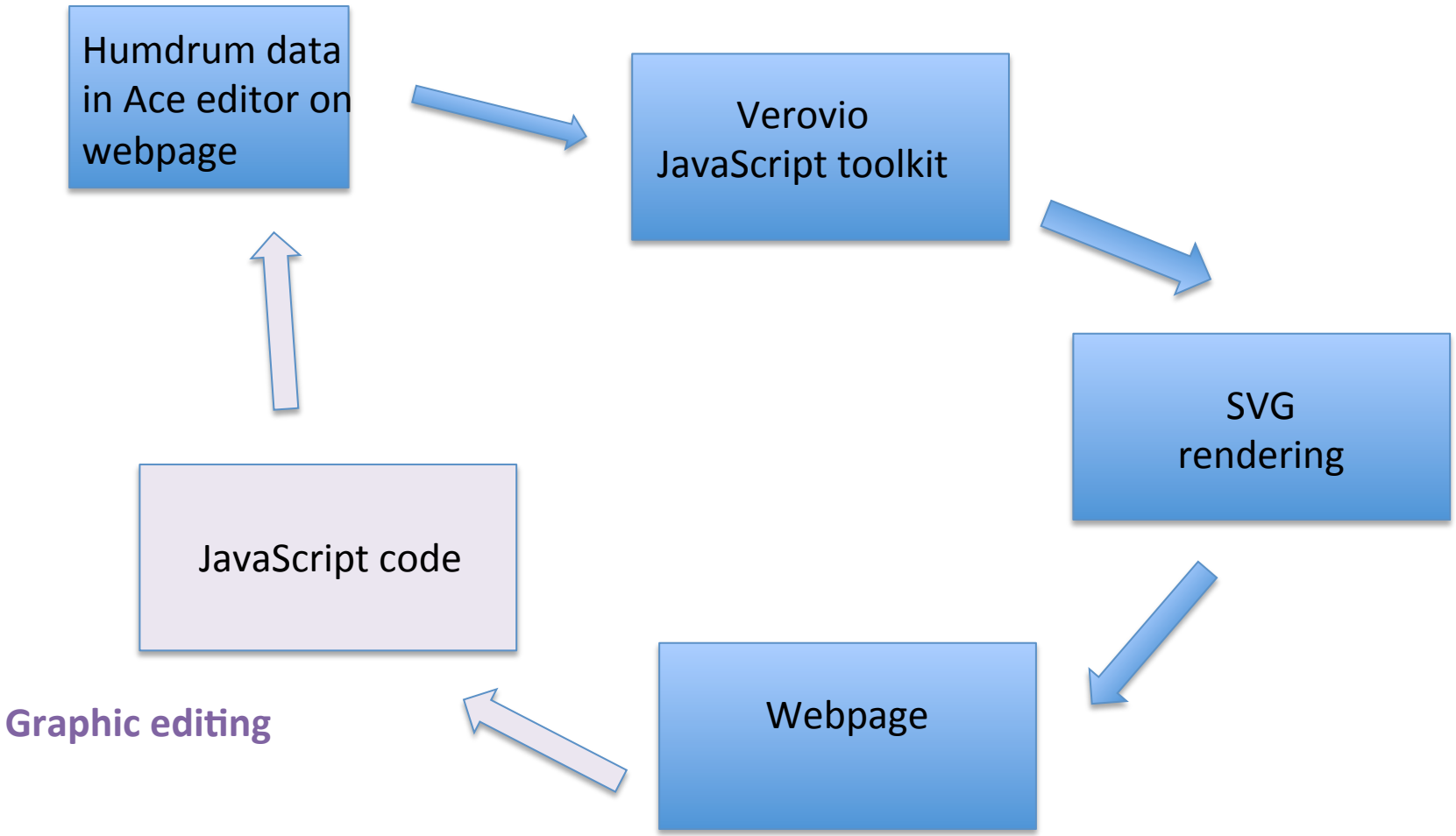


Graphical Editing: add/move slur



- Click on a note
- Type “s” to add a slur to next note
- Type “3s” for 3-note slur
- Left/right arrows move slur start
- Shift-L/R arrows move slur end
- Click on “?” icon for more editing commands

VHV Architecture

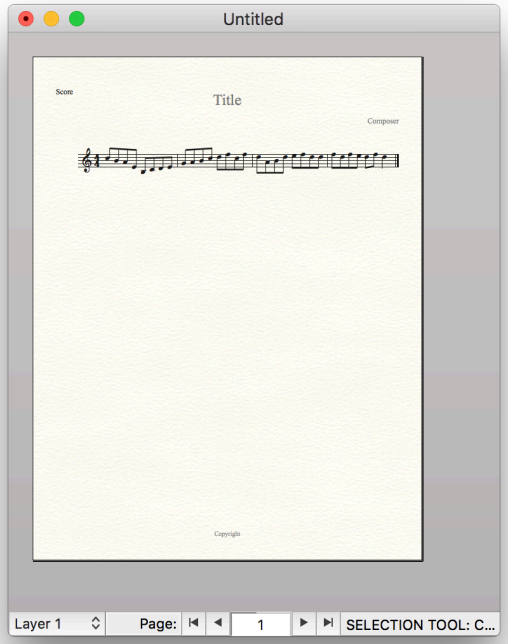


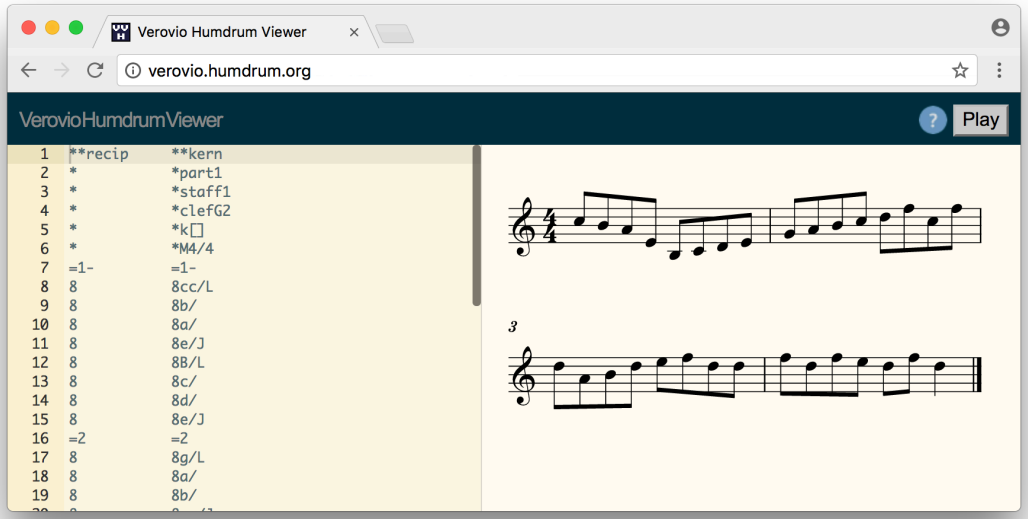
MusicXML input

MusicXML file

Verovio JavaScript toolkit

Humdrum data in Ace editor on webpage

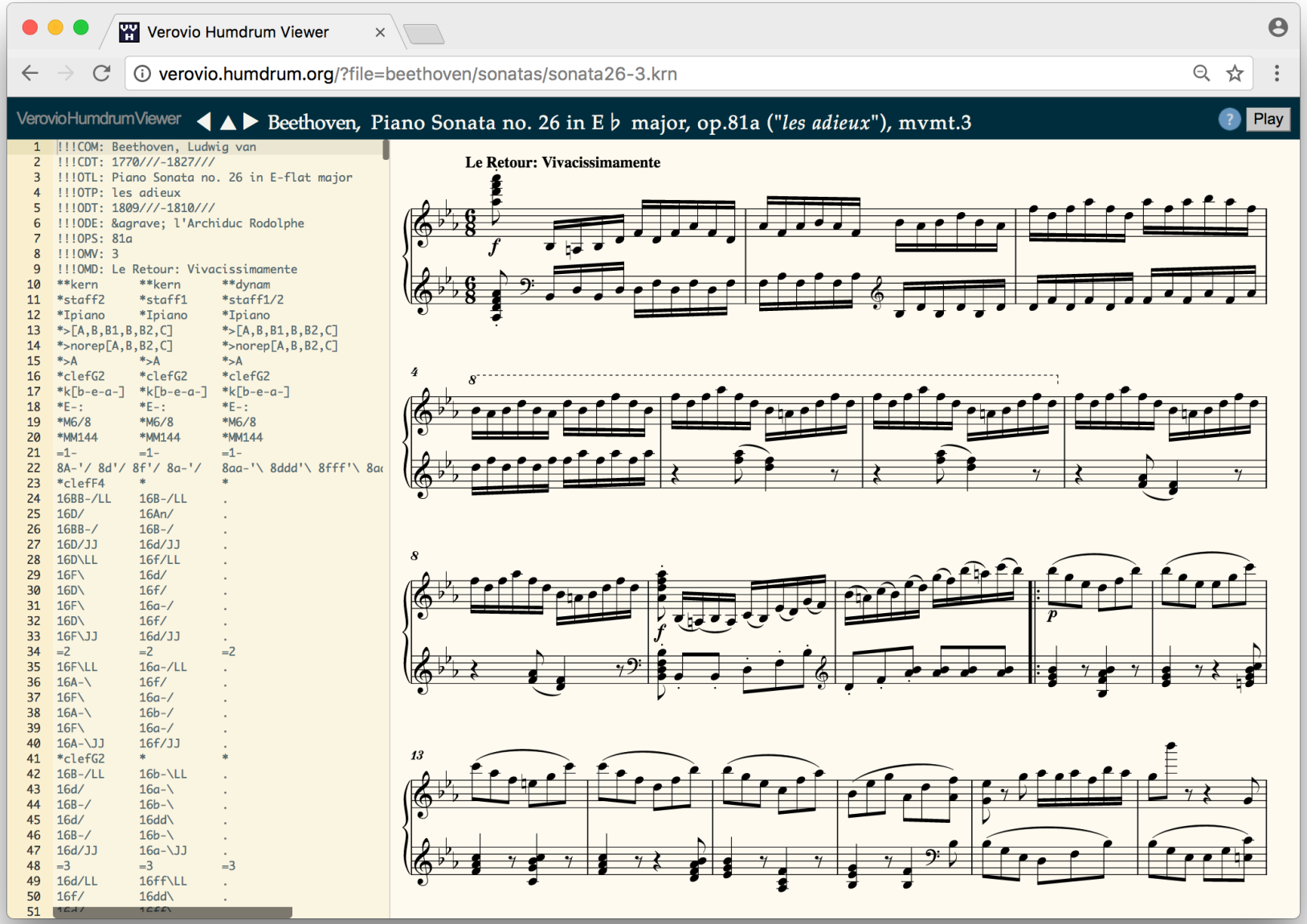




Finale

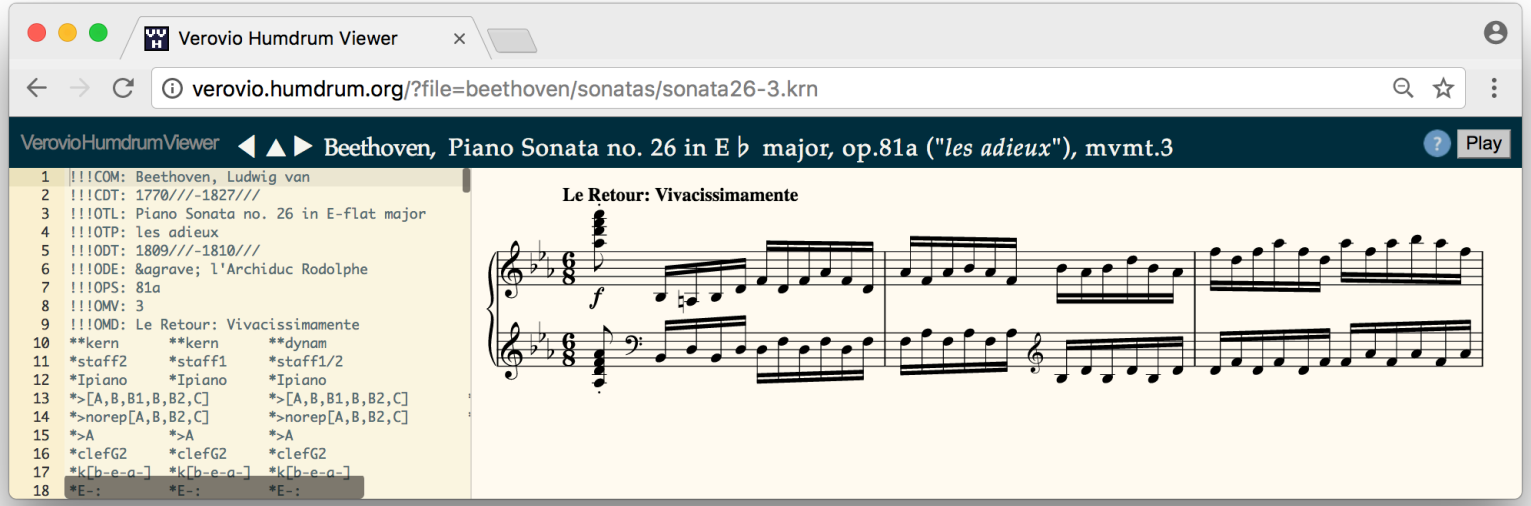
Export MusicXML, then drag/drop onto VHV page

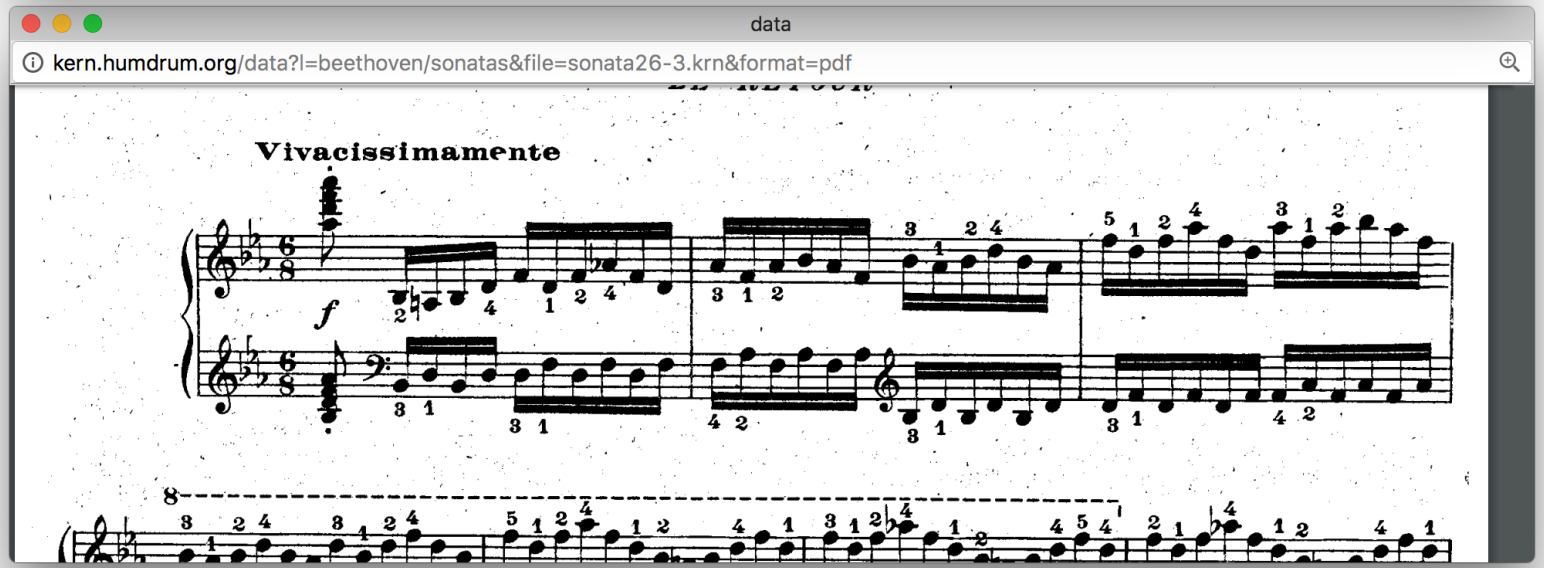
Repertories on VHV



Reference Scans

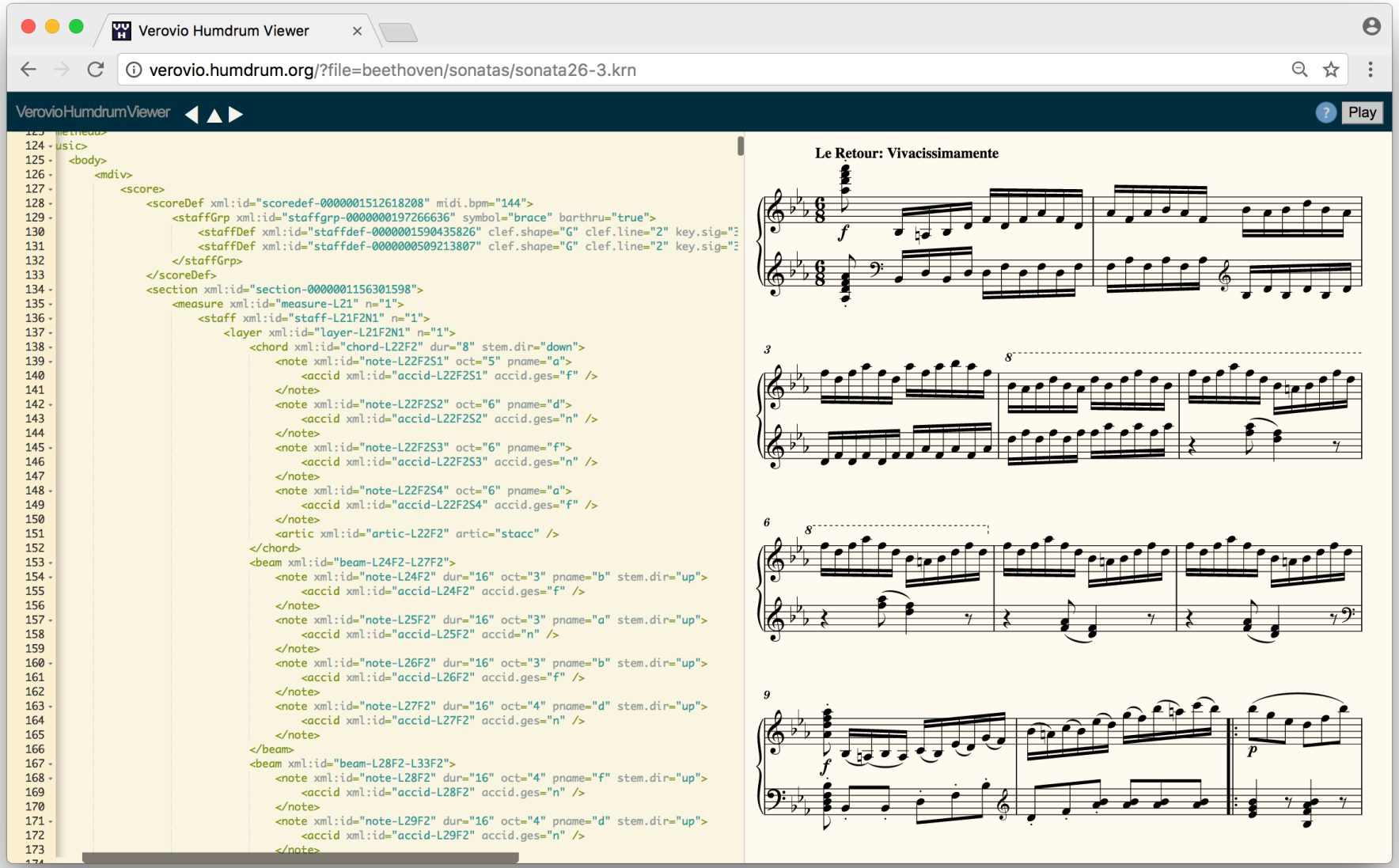
alt-p will display PDF of source scan (when available)



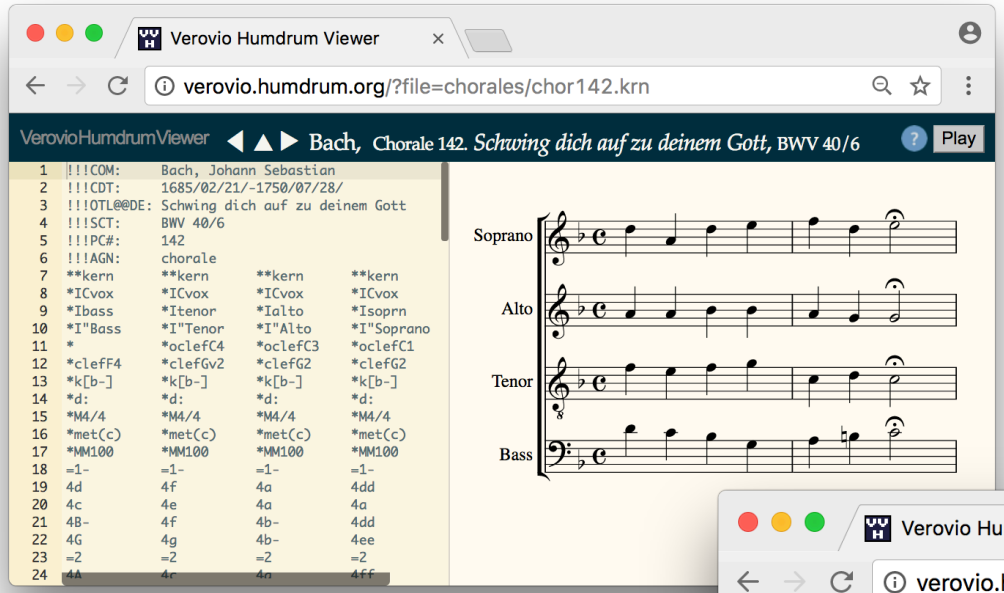


View MEI data

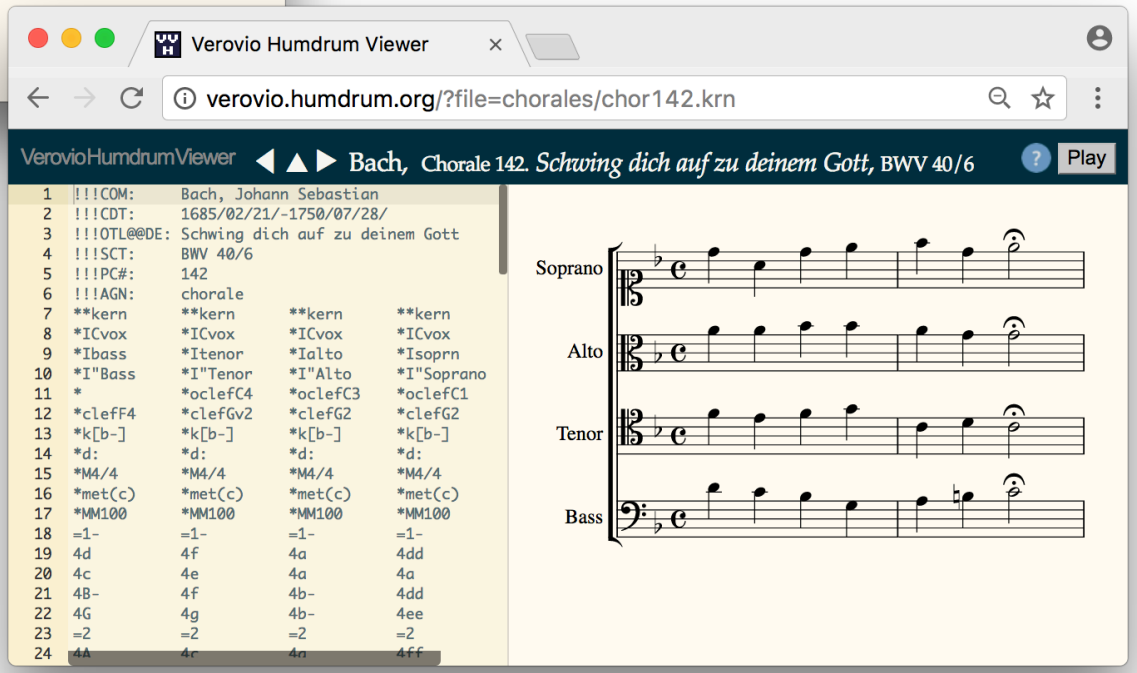
Press alt-m to view MEI conversion (alt-h to go back to Humdrum)



Example of critical edition features



Press “alt-o” to view “original clefs”



App(aratus)/Reading

Humdrum:

```
*          *oclefC4  *oclefC3  *oclefC1
*clefF4    *clefGv2  *clefG2   *clefG2
```

MEI:

```
<app>
  <lem/>
  <rdg label="original_clef">
    <scoreDef >
      <staffGrp>
        <staffDef clef.shape="C" clef.line="1" n="1" />
        <staffDef clef.shape="C" clef.line="3" n="2" />
        <staffDef clef.shape="C" clef.line="4" n="3" />
      </staffGrp>
    </scoreDef>
  </rdg>
</app>
```

lem: Lemma (default: don't add original clefs)